TEACHER EVENT CHECKLIST
A PLACE IN SPACE EXPEDITION (Space Station History)

Date Completed	PRE EVENT REQUIREMENTS
	1. Print out a copy of this entire file (color copy preferred). Please note: this document is 14 pages long.
	2. Sign Agreement to Participate and E-Mail to the Distance Learning Outpost within 3 business days of confirmation.
	3. Have students take Pre-Event Quiz on page 6.
	4. Complete all pre-event activities with the students on page 4.
	5. Teacher to E-mail a minimum of 5 student questions to our office no later than 3 business days prior to your event.
	6. Review NASA Event Guidelines with students on page 13.
	DAY OF EVENT ACTIVITIES
	1. The students will be asked to share their results from their pre-work activities with the NASA DLO presenters.
	2. Bring classroom designs and models to support student presentations.
	POST EVENT REQUIREMENTS
	1. Have students take Post-Event Quiz to demonstrate knowledge of subject.
	2. Teacher(s) and students to fill out event feedback.
	3. Distance Learning Outpost will respond to any follow-up questions.
	4. At Teacher's discretion, students can complete extended activities.

Teacher Agreement To Participate
NASA's Distance Learning Outpost

I have reviewed the Place in Space Learning Module and agree to complete all of the required activities with my students, both prior to, and following, the video teleconferencing event.

Teacher(s) _____

School/Institution _____

Event # _____

Date of Event _____

NASA's Distance Learning Outpost
A Place in Space

Instructional Goal

Upon completion of this learning module, students will be familiar with past and current efforts to build a permanent presence in space and use some practical engineering skills to design and construct a space station of the future.

Learning Objectives

1. Students will be able to recall early ideas by people and their efforts to build a presence in space.

2. Students will become aware of NASA's current and near future efforts to build, live and work aboard the International Space Station.

3. Students will research, construct, and share with NASA their designs for a future space station.

National Education Standards

Science Standards (NSTA)

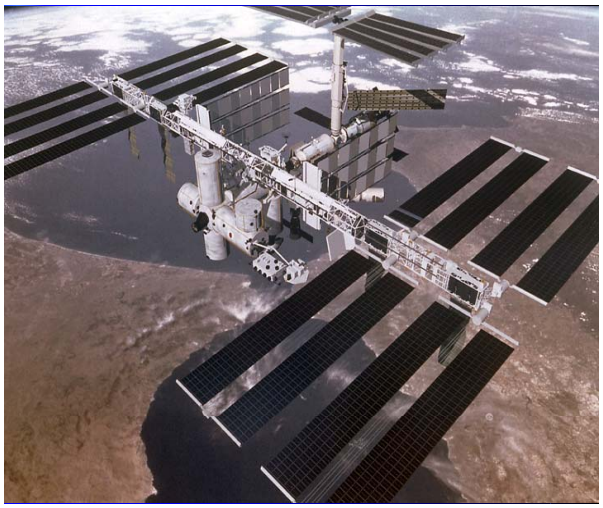
Science as Inquiry
Abilities necessary to do scientific inquiry
Understanding scientific inquiry

Science and Technology
Abilities of technological design
Understanding science and technology

History and Nature of Science
Science as a human endeavor
Nature of Science

Mathematics Standards (NCTM)

Understand the meaning of operations and how they relate to each other.
Analyze characteristics and properties of two-and-three dimensional geometric objects.
Apply a variety of techniques, tools, and formulas for determining measurements.
Build new mathematical knowledge through work with problems.



Grade Level:

Grades K-12

Estimated Time Requirements:

- Activity Set #1 30 minutes
- Activity Set #2
    a. Activity A 50 minutes
    b. Activity B 50 minutes
    c. Activity C 50 minutes
    d. Activity D 75 minutes
- Activity Set #3 25 minutes
- Video Teleconference 50 minutes

STUDENTS WILL PRESENT RESULTS AND PROJECTS DURING THE DLO EVENT.

Texas Essential Knowledge and Skills (TEKS)

Science : K.2A,C; K.6D; 1.2A,C; 1.3; 2.2A,C; 2.3; 3.3C,D,E; 6.2; 6.3; 6.13B; 7.2; 7.3; 8.2; 8.3; Astronomy.7E

Math: K.8A; K.2A,B; 1.3; 1.6A; 1.7A; 1.12A; 2.3; 2.9; 2.13; 3.3; 3.15; 4.3; 4.15; 6.2; 6.3; 6.4; 6.8; 6.11; 6.12; 7.2; 7.3; 7.4; 7.9; 7.13; 7.14; 8.2; 8.14;
Mathematical Models with Applications c.1 A,B,C
c.3 A,B,C

OVERVIEW

Go back to the future to learn about the dreams and efforts by humans to build a presence off our planet and into space. Become an Engineer, design the next generation of space stations in your classroom and present your ideas to NASA's Distance Learning Outpost.

INSTRUCTIONAL STRATEGY

Pre-Event Classroom Component

Class Activity Set # 1

1. Students take Pre-Event Quiz to test their knowledge prior to these lessons about Space Stations. Students keep these quizzes on file to compare to their Post-Event Quiz.

2. Students should become familiar with some terminology that will be used in the activities and during the event with NASA. It is up to the teacher's discretion on how and when to introduce the terms.

Class Activity Set # 2

1. Grades K-4

   Please complete AT LEAST one, preferably both, activity below with your class.

   - Activity A on page 9. In this activity, students will compare their day's activities to an astronaut's typical day's activities while in space.
   - Activity B on page 9. In this activity, students find the most popular electrical appliance in their home and write how life would be without electricity. The activity is tied directly to the need for electricity on the International Space Station.

2. Grades 3-5

   Please complete AT LEAST one, preferably both, activity below with your class.

   - Activity C on page 10. In this activity, students work individually or in teams to complete their Space Station designs.
   - Activity D on page 11. In this activity, students compare ideas on what is needed for a trip aboard a small spacecraft.

3. Grades 5-12

   Please complete the activity below with your class.

   - Activity E on page 12. In this activity, students work individually or in teams to complete their Space Station designs.

Students will be asked to present their ideas, results, and designs during the NASA DLO event.

Class Activity Set # 3

1. Student Questions – A Desire To Explore Further
   - Develop at least 5 questions from the class on space stations.
   - These questions should go beyond the basic information within the program
   - E-mail your questions at least 3 business days prior to your event with NASA
   - E-mail address is: DLO1@jsc.NASA.gov

2. Prepare students for a live video teleconference with NASA's Distance Learning Outpost.

Class Activity Set #1
Pre/Post Quiz
A Place In Space Expedition

1. Who were Konstantine Tsiolkovsky and Verner Von Braun? What were their contributions to space exploration?

2. What was the first space station to fly? What was the country that launched it and what was its purpose?

3. What is the International Space Station? Which countries are building it and what is the purpose of the station?

4. What will the International Space Station astronauts spend most of their time doing?

5. How will NASA engineers construct the International Space Station?

6. Where, in space, should the next space station be built? What should be it's main purpose and why?

Pre/Post Quiz
A Place In Space Expedition

TEACHER ANSWER KEY – Please don't share with the students. Answers should be similar to:

1. **Who were Konstantine Tsiolkovsky and Verner Von Braun?**

   What were their contributions to space exploration? Konstantine was a Russian math teacher (1800s) who developed the first major theories of rocket propulsion and space flight. Also suggested the idea to build permanent human habitation outside our own planet. Von Braun, the German scientist who developed the Saturn V rocket that propelled the first human to the moon, was also an advocate of human habitation in space.

2. **What was the first space station to fly? What was the country that launched it and what was its purpose?**

   The world's first space station was the USSR's Salyut (meaning "greetings") in 1971. A collaboration between the USSR's space agency and military, they chose to establish a scientific-observational-surveillance presence in orbit.

3. **What is the International Space Station? Which countries are building it and what is the purpose of the station?**

   The International Space Station (ISS) is a collaborative effort between 16 countries to conduct scientific-technological-engineering research that will take advantage of a microgravity environment that will result in benefiting everyone here on earth.

4. **What will the Space Station astronauts spend most of their time doing?**

   After the completion of the station the majority of the astronauts time will be devoted to research in the areas of: Combustion Science, Biomedical Research, Materials Science, Fluid Physics, Ecology, Meteorology and effects of space on the human body.

5. **How will NASA engineers construct the International Space Station?**

   Individual pieces, hardware and modules are constructed on earth, launched into orbit by the Space Shuttle or by Proton rockets. They are then assembled and attached to the ISS by the astronauts during EVAs and robotic helpers such as the Canadarm 2 on the ISS.

6. **Where, in space, should the next space station be built? What should be it's main purpose and why?**

   An open-ended question that will allow students to suggest viable answers and provide supporting reasons.

A Place In Space Terminology

The following is a list of words and definitions that your students need to be familiar with because the words are used throughout the activities and video teleconference. They will be asked to explain the meaning of these terms **in their own words** during the video teleconference.

Attitude Control Thrusters – small propulsion device that controls the orientation of the Space Station.

Core Module – section of the Space Station where the brains exist

Diameter – distance across a circle through the center point

Docking Port – section of the Space Station where the Space Shuttle will connect to dock.

Habitation Module – section of the Space Station where astronauts will live

International Space Station (ISS) – facility in space with living quarters, workspace, and its own environmental control and power generation equipment

Laboratory Module – section of the Space Station used to run experiments

Photovoltaic (PV) Array – device that collects solar energy and converts it into electricity also known as solar panels

Radius – distance from the center point of a circle to the edge of the circle

Robotic Arm – mechanical arm used to assemble and repair the Space Station

Thermal Radiators – panel or section of the Space Station that distributes heat from the electronic equipment

Truss – structural support on the Space Station that is used either to mount equipment or to connect sections together

Microgravity – a small amount (1/1,000,000) of the effect of gravity

Gravity – the force of attraction between bodies of mass or the pull on all bodies in the earth's sphere toward the earth's center

Activity A
A Place In Space Expedition
Grades K-4

Time On Your Hands

In this activity, students will compare their day's activities to an astronaut's typical day's activities while in space.

http://media.nasaexplores.com/lessons/02-020/k-4_1.pdf

"Astronauts Need To Have Fun, Too" article for background information.

http://www.nasaexplores.com/search_nav_k_4.php?id=02-020&gl=k4

Student Presentation:
Students will be asked to share their comparisons during the NASA DLO event.

Activity B
A Place In Space Expedition
Grades K-4

The Need For Electricity

In this activity, students find the most popular electrical appliance in their home and write how life would be without electricity. The activity is tied directly to the need for electricity on the International Space Station.

http://media.nasaexplores.com/lessons/01-058/k-4_1.pdf

"No Candles On The Space Station" article for background information.

http://nasaexplores.com/search_nav_k_4.php?id=01-058&gl=k4

Student Presentation:
Students will be asked to discuss how their lives would be different without electricity during the NASA DLO event.

Activity C

A Place In Space Expedition

Grades 3-5

Engineer Your Own Space Station

Be an engineer and build your own Space Station with plastic bottles and PVC pipe connectors. Students will design their own Station with a laboratory, an equipment and supply storage unit, living quarters, and a solar array to power the Station.

http://spacelink.nasa.gov/products/International.Space.Station.Bookmark/

Student Presentation:

Students will be asked to share their exterior and interior design ideas during the NASA DLO event.

Activity D
A Place In Space Expedition
Grades 3-6

Making the Trip

If you were planning a journey into space aboard a small spacecraft like the Mercury-Atlas 6 "Friendship 7" or a larger spacecraft like the Discovery space shuttle, name at least five items you would you take with you?

In making your decisions, there are several factors you should keep in mind. Your living "space" would have to be adjusted because of:

1. Limited storage space
2. No refrigeration
3. A limit to the total weight allowed
4. Microgravity

Name at least two other special factors you should keep in mind?

A. Consider the questions shown below and make notes on a separate piece of paper:

1. What would you **need** to take with you in order to stay alive for one week in space?
2. What would you **want** to take with you for relaxation and entertainment?

B. When your teacher tells you to, choose a partner and compare your responses.

C. When your teacher tells you to, form a group with another pair of students. Write a final answer to each of the questions.

1. What would you **need** to take with you in order to stay alive for one week in space?
2. What would you **want** to take with you for relaxation and entertainment?

D. Have one member of your team prepare to give a team response, including an explanation of your choices.

This activity was developed by Ruth Petersen, Integral Systems.

Activity E
A Place In Space Expedition
Grades 5-12

Functions and Statistics: International Space Station: Up to Us

Background:

Given a set of materials and constraints, students will work in groups to design and alternative model of the ISS. Through data analysis and interpretation, students will determine the best space station design, based on budget restrictions and component placement.

Procedure:

The following link will take you to the activity. http://connect.larc.nasa.gov/connect_bak/pdf/00_5.pdf (pages 4-13)

Student Presentation:
Students will be asked to share their exterior and interior design ideas during the NASA DLO event.

The following web sites offer information about the International Space Station they you may find useful in this activity:

An educational Guide to Skylab with interior and exterior labeled illustrations.

http://history.nasa.gov/EP-107/ep107.htm

The latest on the International Space Station assembly and history at NASA

http://www.spaceflight.nasa.gov/station/assembly/index.html

NASA Event Guidelines

Review the following points with your students prior to the video teleconference event:

1. A video teleconference is a two-way event. Students and NASA presenters can see and hear one another.
2. Students are representing their school; they should be on their best behavior.
3. Students should be prepared to give brief presentations, ask questions and respond to the NASA presenters.
4. A Teacher(s) or other site facilitator should moderate students' questions and answers.
5. Students should speak into the microphone in a loud, clear voice.

Get Ready, Be Ready, and have fun with your Distance Learning Event with NASA!

Post-Event Teacher – Student Evaluation

1. **We need your help and support!** Choose the appropriate Form below. It usually takes teachers and students **less than 10 minutes** to complete. We welcome any input that you have at the following sites:

    - Teacher Feedback Form:
      https://ehb2.gsfc.nasa.gov/edcats/centers/distance_learning.html
    - Student K-3 Feedback Form:
      https://ehb2.gsfc.nasa.gov/edcats/centers/jsc_grades_K3_stud_fdbk.html
    - Student 4-12 Feedback Form:
      https://ehb2.gsfc.nasa.gov/edcats/centers/dlo_412_student.html
    - Technical Contact Feedback Form:
      https://ehb2.gsfc.nasa.gov/edcats/centers/jsc_dlo_tech_contact.html
    - Parent/Chaperone Feedback Form:
      https://ehb2.gsfc.nasa.gov/edcats/centers/distance_learning_parent.html

2. Students and Teachers are **welcome to e-mail the Distance Learning Outpost** with any follow-up questions from the event at: mailto:DLO1@jsc.nasa.gov

3. **Please send** us any photos, video, web page link, newspapers articles, etc. of your event. We will be glad to post them on our web page!

Extended Activities for A Place In Space

1. Perform further research on the Internet at http://spacelink.nasa.gov/Instructional.Materials/On-line.Educational.Activities/

2. International Space Station Challenge - This website offers problem-solving activities based on authentic engineering and technology challenges related to the design, construction and maintenance of the International Space Station (ISS). Students are encouraged to work in teams to complete model-building, ISS tracking, life science research and simulation analysis, and develop emergency escape design challenges.

3. For general NASA information go to: www.nasa.gov